Authentication for Web Services

Ray Miller <raym@herald.ox.ac.uk>
Systems Development and Support
Computing Services, University of Oxford

Overview

- Password-based authentication
- Cookie-based authentication
- Using cookies for single sign-on
- Kerberos
- Stanford WebAuth
- Integrating uPortal and WebAuth

Basic authentication

- The simplest authentication scheme used for web services is *HTTP Basic Authentication,* defined in RFC 1945
  - When a client requests a protected resource, the server responds with *401 (Authorization required)*
  - The client resends the request with an *Authorization* header encoding the username and password

Basic authentication

- Often used in conjunction with *htaccess* and *htpasswd* files under the control of the information provider
- Username and password information can also be stored in a database (GNU DBM, Berkeley DB, mySQL, PostgreSQL, LDAP)

Basic authentication

- HTTP is a *stateless* protocol: every time a client requests a protected resource, it must include an *Authorizaton* header that the server must verify
- If account information is held in a remote database, the web server will have to verify the username and password against the remote data source for every client request

Cookies

Cookies

- When responding to an HTTP request, a server may also send a piece of state information that the client will store:

```
Set-Cookie: NAME=VALUE; expires=DATE;
path=PATH; domain=DOMAIN_NAME; secure
```

- This state object is known as a *cookie*
- The cookie will be sent by the client along with any future requests to the specified domain/path

Cookies

- Cookies enable state to be stored between HTTP requests
- A server can issue a *session cookie* after authenticating a user for the first time
- The server can use the session cookie to identify the user when they make future requests
- No need to verify the username and password for every request

Using cookies for SSO

- By introducing a central log-in server, we can use cookies to provide intra-institutional single sign-on for web services
  - Pubcookie (University of Washington)
  - BrownTicket (Brown University)
  - Cosign (University of Michigan)
  - WebAuth (Stanford)

SSO components

- These cookie-based single sign-on systems all consist of several components:
  - a user agent (web browser)
  - an application server
  - a login server
  - an external authentication service

The login server

- trusted, central authentication service
- interacts directly with users
- verifies usernames and passwords with backend authentication services
- issues cookies to users to provide single sign-on functionality
- provides authentication information to application servers

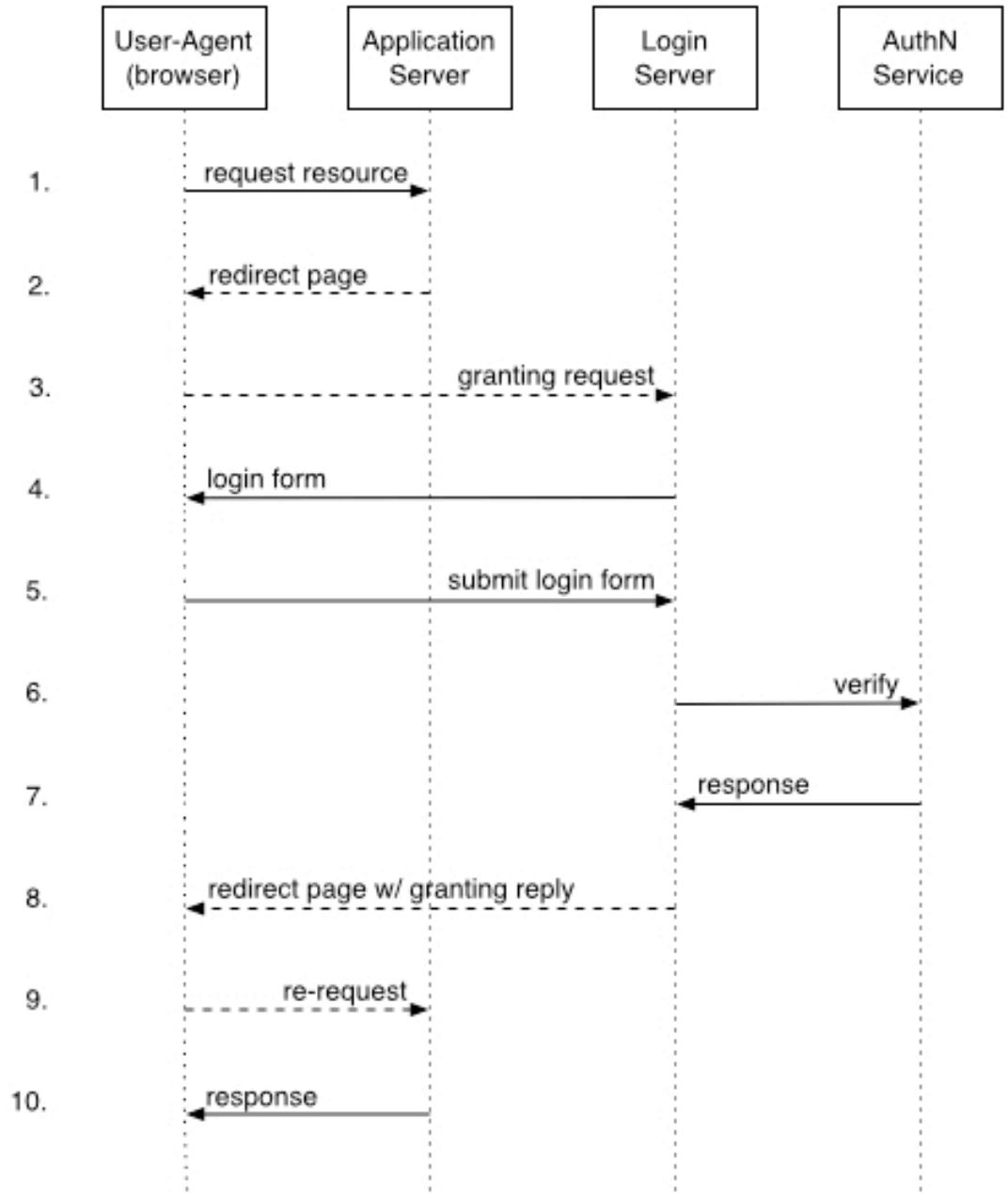
The application server

- authentication *enforcer*
- redirects users who haven't been authenticated to the login server
- verifies authentication information returned from the login server
- issues cookies to maintain authenticated application sessions
- provides user authentication information to applications

The external authentication service

- verifies user authentication information sent from the login server
  - Kerberos
  - LDAP
  - NIS

How it works


User-Agent (browser)
Application Server
Login Server
AuthN Service
1.
request resource
2.
redirect page
3.
granting request
4.
login form
5.
submit login form
6.
verify
7.
response
8.
redirect page w/ granting reply
9.
re-request
10.
response

This really is SSO

- If the user requests a protected resource from a new application server, they will be redirected to the login server
- They already have a cookie for the login server, so they don't need to re-authenticate
- The login server simply issues the appropriate cookie and directs them back to the application server

Benefits

- Passwords, if used, are only sent to the central login server over SSL
- Users need only authenticate once per session to access any protected resource
- Can leverage an existing authentication system
- Works with almost all modern browsers

We've seen this before...

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- This looks a lot like the Kerberos single sign-on protocol:
  - cookies issued by the login server grant access to a particular application server; they are like Kerberos *service tickets*
  - the cookie shared between the browser and the login server is like a Kerberos *ticket-granting ticket*

Stanford's WebAuth

- Takes the Kerberos analogue a step further
  - The cookie shared with the login server *really is* a Kerberos ticket-granting ticket
  - The cookie issued for access to an application server *really is* a Kerberos ticket

Why does this matter?

- The designers of the Kerberos protocol have already solved many of the security problems associated with ticketing systems

There's another advantage

- What happens when the application server needs authenticated access to another service?
  - For example, Herald's WING servers need to authenticate the user when opening a connection to an IMAP server on their behalf

Secondary tickets

- Stanford's WebAuth system includes support for *secondary tickets*
  - When the application server redirects the user to the login server, it can request tickets for additional services
  - The user's ticket-granting ticket shared with the login server takes care of this
  - Multiple tickets are encoded in cookies sent to the application server

The WebAuth login server

- The login server component of WebAuth consists of two CGI programs, *login.fcgi* and *logout.fcgi*, and an Apache 2.0 module, *mod_webkdc*
- You don't need to worry about this: the login server will be provided centrally

The WebAuth application server

- The *mod_webauth* module provides an authentication handler for Apache 2.0

```
LoadModule webauth_module modules/mod_webauth.so

WebAuthKeyring conf/webauth/keyring
WebAuthKeytab conf/webauth/keytab
WebAuthServiceTokenCache conf/webauth/service_token_cache
WebAuthLoginURL https://webkdc/login/
WebAuthWebKdcURL https://webkdc/webkdc-service/
WebAuthWebKdcPrincipal   service/webkdc

<Location /private/>
AuthType WebAuth
Require valid-user
</Location>
```

The WebAuth application server

- The WebAuth module provides information in additional environment variables to the SSI and CGI namespace

`WEBAUTH_USER`	Name of the WebAuth authenticated user
`WEBAUTH_TOKEN_CREATION`	When the token was created
`WEBAUTH_TOKEN_EXPIRATION`	When the token will expire
`WEBAUTH_TOKEN_LASTUSED`	When the token was last used
`REMOTE_USER`	Name of the WebAuth authenticated user
`AUTH_TYPE`	Set to `WebAuth`

Integration with Perl and PHP

- Perl CGI scripts can access information about the authenticated user via environment variables

```
my $webauth_user = $ENV{'WEBAUTH_USER'}
```

- As can PHP

```
$webauth_user = getenv('WEBAUTH_USER');
```

Integration with Java/Tomcat

- When Apache 2.0 is used to proxy requests to Tomcat, mod_webauth can be used in conjunction with mod_jk in order to pass environment variables to the Java servlet

The sticky issue of authorization

- Now that we've authenticated the user, how do we decide whether or not they're authorized to use this service?

The sticky issue of authorization

- The latest version of WebAuth includes an Apache 2.0 authorization module, *mod_webauthldap*
  - Can allow access to groups of individuals defined in LDAP
  - Can include arbitrary attributes from an LDAP record in environment variables

The sticky issue of authorization

- Alternatively, an application can make its own authorization decision based on the identity of the authenticated user
  - For example, by performing its own LDAP lookup

Integration with uPortal

- We should be able to use Apache 2.0 with mod_webauth and mod_jk to proxy requests to the Tomcat instance running uPortal
- Will require some changes to uPortal to extract information about the authenticated user from environment variables

Integration with uPortal

- This might not be flexible enough for uPortal channels that require secondary tickets
  - Implement the WebAuth protocol in pure Java for uPortal?

Where we are now (May 2003)

- We have a working kdc (Kerberos domain controller), but none of our services are Kerberos-enabled
- We have a working WebAuth login server
- We have a working WebAuth application server

Where we are now (May 2003)

- We have not yet tried the latest WebAuth with LDAP support for authorization
- We have not set up the Apache 2.0 proxy to uPortal
- The kdc and WebAuth login server are some way from being production-ready

References

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- http://www.pubcookie.org/
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- http://www.umich.edu/~umweb/software/cosign/
- http://webauthv3.stanford.edu/
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